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Review of Potential Sources of Contamination in the Vicinity of Groundwater Area of Interest GW 2/3, Anchorage Terminal Reserve

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Summary

This memorandum summarizes the results of a review of contaminated site reports maintained by the Alaska Department of Environmental Conservation (ADEC) to identify potential sources of vinyl chloride and other chlorinated compound contamination on properties hydraulically upgradient of the Alaska Railroad Corporation (ARRC) Anchorage Terminal Reserve Groundwater Area of Interest GW 2/3. This task is part of the Area GW 2/3 Supplemental Groundwater Investigation authorized by the United States Environmental Protection Agency (EPA). The EPA has authorized further investigation of potential offsite sources, including review of available records and groundwater sampling and analysis. The groundwater sampling and analysis task is not planned to be implemented at this time.

Based on the records reviewed, the Municipal Light and Power (ML&P) Fleet Services Maintenance Facility, 1121 East 1st Avenue, has historical chlorinated hydrocarbon contamination and site conditions that could lead to the formation of vinyl chloride observed at the GW 2/3 Area.

Background

Remedial investigation (RI) field work was conducted by the ARRC in August 2005 and August 2006. Based on laboratory results, an area of groundwater contaminated with vinyl chloride and other chlorinated hydrocarbons was located on the south side of Ship Creek along Ship Creek Avenue, west of Ingra Street. This area, identified in the draft RI report (ENSR/AECOM, 2007) as Area GW 2/3, is shown in Figure 1. Maximum vinyl chloride concentrations of 23 and 25 micrograms per liter ($\mu\text{g/L}$) were detected at groundwater probes MWB-09A1 and MWB-09B2 in the vicinity of lease property LP-077, which is currently occupied by Tire Centers, LLC. The groundwater flow was interpreted to be towards the west-northwest and discharging to Ship Creek. Elevated vinyl chloride was also

detected in several downgradient monitoring points, including 19 µg/L at DPB-08A1 (765 feet downgradient of LP-077) and 17 µg/L at DPB-08B3 (1,040 feet downgradient of LP-077). The USEPA maximum contaminant level (MCL) for vinyl chloride is 2 µg/L.

Vinyl chloride is typically present in the environment as a breakdown product of the chlorinated solvents trichloroethene (TCE) and tetrachloroethene (PCE). In the draft RI report, the ARRC concluded that "The distribution of vinyl chloride in the GW-2/3 area suggests the source of vinyl chloride groundwater impacts is the area encompassing lease LP-077" and "The apparent absence of PCE and TCE indicates that the source materials have been exhausted and that essentially all PCE and TCE have been transformed to lesser chlorinated VOCs, including c12DCE [cis-1,2-dichloroethene] and vinyl chloride."

Another possibility could be that vinyl chloride has migrated in the groundwater from an upgradient source area where TCE or PCE was released. A typical source would be a surface spill or release from a leaking underground storage tank at a machine or maintenance shop, paint shop, or dry cleaner facility. Biological degradation by naturally-occurring microorganisms in the soil and groundwater can breakdown TCE and PCE to vinyl chloride when the plume is commingled with petroleum hydrocarbons or other types of organic carbon, providing an electron donor for the reductive dechlorination reactions. Vinyl chloride may persist in the downgradient plume if the electron donor material is exhausted or conditions are not favorable for further biodegradation.

A background review was conducted to identify potential upgradient sources that may warrant further evaluation by the ARRC for the RI and Feasibility Study (FS). If a source for the vinyl chloride is not properly identified in the RI/FS, then remediation may be focused at the wrong locations and would not likely be successful.

Contaminated Sites Record Review

The ADEC Contaminated Sites database was reviewed for potential sources of chlorinated solvent and petroleum hydrocarbon groundwater contamination in the upgradient vicinity of Area GW2/3. Area GW 2/3 lies near the base of a bluff in the floodplain valley adjacent to Ship Creek. Groundwater flow in the shallow, unconfined aquifer on the immediate south side of Ship Creek tends to be to the west-northwest and discharges to the creek, so upgradient areas would be to the east-southeast. Groundwater flow south of Area GW 2/3 would be influenced by the topography of the bluff and may flow from the south or southeast.

ADEC files were reviewed for the area approximately bounded by Eagle Street to the west, Post Road to the east, 4th Avenue to the south, and the Ship Creek waterway to the north. The following sites in ADEC's database were identified for further review (grouped according to potential upgradient groundwater flow directions):

East of GW 2/3

- Municipal Light and Power (ML&P) Fleet Services Maintenance Facility, 1121 East 1st Avenue

Southeast of GW 2/3

- Pacific Environmental Corporation (PENCO) property, 920 1st Avenue
- ML&P offices and warehouse, 1120 East 1st Avenue
- ML&P storage building (former ML&P Technical Service Station), 1201 East 3rd Avenue
- Anchorage Cold Storage/Odom (former Firestone Tire and Rubber Company), 105 South Post Road

South of GW 2/3:

- Alaska Real Estate Parking Lot (former dry cleaner site), 717 East 4th Avenue

Figure 1 shows the locations of these sites and lists the historical maximum values of petroleum hydrocarbons and chlorinated compounds (TCE, PCE, and vinyl chloride) detected at the sites. Attachments A through F include site maps and analytical result tables from reports on file at the ADEC.

Site Summary Information

East of GW 2/3

ML&P Fleet Services Maintenance Facility, 1121 1st Avenue – This site is the location of the ML&P fleet service maintenance garage and is located approximately 1,200 feet east of Area GW 2/3. It is hydraulically upgradient, as shown by the groundwater contours in the Draft RI Report (ENSR/AECOM, 2007; Figure 5-3). On October 26, 1990, a waste oil tank was removed from the northeastern side of the garage. Soil samples collected from the perimeter of the tank excavation contained petroleum hydrocarbon concentrations as high as 5,690 milligrams per kilogram (mg/kg), and methylene chloride, PCE, and 1,1,1-trichloroethane were detected in most of the soil samples submitted for laboratory analysis. PCE and TCE were detected in samples from 5 groundwater monitoring wells at concentrations ranging from 4.7 µg/L to 9.0 µg/L for PCE and 27 µg/L to 48 µg/L for TCE (HLA, 1993).

ML&P discovered detectable concentrations of TCE in existing downgradient monitoring wells during a routine sampling event. Monitoring well 2A4, located southwest of the garage, was subsequently determined to contain 17 µg/L TCE, 1.2 µg/L 1,1-DCA, and 2.0 µg/L 1,1,1-trichloroethane. Monitoring well 2A6, located downgradient of the facility to the west, contained 16 µg/L TCE and 2.6 µg/L PCE (Shannon and Wilson, 1993).

Three additional monitoring wells were installed at the site on July 16, 1993. The highest concentrations of chlorinated VOCs were detected at monitoring well MW-2, located in the center of the former waste oil UST excavation. PCE, TCE, and 1,1,1-TCA concentrations in a sample from this well were 25 µg/L, 43 µg/L, and 160 µg/L, respectively (Shannon and Wilson, 1993). Seven rounds of quarterly sampling were conducted at MW-2 between September 2002 and May 2004. Chlorinated VOCs were detected in these samples ranging from 14 to 44.7 µg/L for PCE and 10.1 to 21.7 µg/L for TCE (ML&P, 2004).

In 1989, a leaking gasoline underground storage tank (UST) was discovered and removed just south of the former waste oil tank. ML&P estimated that approximately 700 gallons of fuel had been released from the UST between March 2 and March 29, 1989. Following discovery of the release, the 4,000-gallon gasoline UST was removed along with a 4,000-

gallon diesel UST and a gravel-bottomed oil/water separator. During the removals, approximately 400 cubic yards of impacted soil were excavated and approximately 28,377 gallons of oily water (approximately 586 gallons of product) were removed from the excavation (Golder Associates, 1997).

In late 1989, a groundwater pump and treat system and soil vapor extraction system were installed at the former gasoline UST site. The systems were started in January 1990 and operated for at least 6 years (Golder Associates, 1997).

The combination of chlorinated VOCs and petroleum hydrocarbons in the groundwater around the former waste oil and gasoline USTs would create suitable conditions for reductive dechlorination of PCE and TCE to vinyl chloride. This site is in close proximity and hydraulically upgradient of the GW 2/3 area and may be a source of the vinyl chloride observed in the groundwater.

ENSR/AECOM noted that several wells (DPB-24, MWB-09D3, MWB-09D2, and MWB-09D1) located between Area GW 2/3 and the ML&P Fleet Services Maintenance Facility did not contain elevated concentrations of vinyl chloride or its parent products. However, the chlorinated VOCs are commingled with a petroleum hydrocarbon plume on the ML&P site. Petroleum hydrocarbon plumes typically naturally attenuate within a couple hundred feet of the source area, whereas chlorinated hydrocarbon plumes may extend several thousand feet, depending on the groundwater conditions. If the chlorinated plume is depleted of electron donors before all of the chlorinated aliphatic hydrocarbons are removed, then reductive dechlorination will cease in the plume. Over the past 20 years, the differences in the groundwater chemistry between the ML&P site (high levels of petroleum hydrocarbons) and Area GW 2/3 groundwater (low levels of petroleum hydrocarbons) may have degraded vinyl chloride in the vicinity of ML&P but allowed it to persist in the downgradient Area GW 2/3.

Southeast of GW 2/3

ADEC files were reviewed for 4 sites located 800 to 2,100 feet southeast of the GW 2/3 area.

PENCO property - This property was purchased by Pacific Environmental Corporation (PENCO) for the proposed construction of a hazardous waste treatment facility. It is located at the intersection of 1st Avenue and Ingra Street approximately 800 feet southeast of Area GW2/3. Phase I and II Environmental Site Assessments (ESAs) were conducted to assess for the presence of soil or groundwater contamination at the site. Five soil borings with two completed as monitoring wells were installed in January 2007. No chlorinated VOCs were detected above method detection limits in either soil or groundwater (E&E, 2007).

Municipal Light and Power (ML&P), 1120 1st Avenue - This site is located approximately 1,200 feet southeast of Area GW2/3 on the south side of 1st Avenue between Ingra Street and Post Road. Preliminary hazardous material site assessments were conducted in 1989 followed by a Phase II Remedial Investigation in 1993. Surface soil was sampled at 20 locations, subsurface soil was sampled from 2 soil borings, and groundwater was sampled from 6 monitoring wells and 18 groundwater probes. Vinyl chloride was detected in three groundwater samples at concentrations between 1.8 and 3.0 µg/L. Because the sample locations were widely scattered throughout the site, the occurrence of vinyl chloride was not believed to be due to sources at the site. Trace levels of 1,1-dichloroethane, TCE, and

methylene chloride were also detected in some samples, all at concentrations below their maximum concentration levels (HLA, 1993).

Municipal Light and Power (ML&P), 1201 3rd Avenue - This site is the former location of the ML&P Technical Service Station, and is currently used as a storage building. It is located approximately 1,400 feet southeast of Area GW2/3 on the north side of 3rd Avenue between Ingra Street and Post Road. Soil sampling was conducted in 1989 and 1990 during the removal of two former gasoline USTs, a former diesel UST and former heating oil UST, and indicated that petroleum hydrocarbons were present in the soil. A follow-up Phase II investigation was conducted in 1993 that included 14 soil borings and 8 groundwater samples. PCE, TCE, or vinyl chloride was not detected in any of the groundwater samples (HLA, 1993).

Anchorage Cold Storage/Odom (former Firestone Tire and Rubber Company), 105 South Post Road - A Phase II Site Investigation was conducted when this site was formerly occupied by Firestone Tire and Rubber Company (URS, 2001). The site is located approximately 2,100 feet southeast of Area GW2/3. As part of the Phase II investigation in 2000, three soil borings were drilled and completed as shallow monitoring wells around the former vehicle maintenance facility. Sediment samples and a water sample were also collected from three sumps in the maintenance bays. No chlorinated VOCs were detected in the soil boring samples. In one sump sediment sample, PCE was detected at 0.297 mg/kg and 1,1-dichloroethane was detected at 1.11 mg/kg. Groundwater samples from the three monitoring wells around the facility only had trace levels of chlorinated VOCs - up to 1.21 µg/L TCE and 3.03 µg/L cis-1,2-dichloroethene, which are below the ADEC groundwater cleanup levels.

The records reviewed from these 4 sites show only very low or non-detectable concentrations of chlorinated VOCs. There does not appear to be a significant source of chlorinated VOCs southeast of the GW 2/3 that would have created the observed vinyl chloride plume.

South of GW 2/3

Alaska Real Estate Parking Lot - This site is currently an undeveloped parking lot; however, it was formerly the location of a dry cleaner (C&K Cleaners) and a tire store (NC Tire Center). The site is located approximately 1,300 feet south of Area GW2/3 at the intersection of 4th Avenue and Gambell Street. A Phase I Environmental Site Assessment (ESA) conducted in 1993 indicated the presence of USTs in the northeast corner of the property. A Phase II ESA was conducted in 2004 and included six test pits for soil sampling and the removal of five hydraulic lifts, two hydraulic USTs, and two heating oil USTs. The test pit soil samples revealed numerous locations with PCE concentrations exceeding the ADEC cleanup criterion (BGES, 2004a). A groundwater sample was also collected from one monitoring well in 2004 and the PCE concentration was 2,280 µg/L. No vinyl chloride or other VOCs were detected (BGES, 2004b). Additional soil and groundwater investigation was conducted in August 2007. The maximum PCE concentration detected in soil samples was 821 mg/kg, and groundwater samples from 7 wells had PCE concentrations ranging between 5.1 and 822 µg/L (BGES, 2007 draft).

The Alaska Real Estate Parking Lot site is a source area for PCE contamination and the extent of groundwater contamination has not been fully delineated. However, groundwater flow directions between this site and the Anchorage Terminal are not well characterized, so there is not currently enough information to determine if a groundwater plume from the site extends to Area GW 2/3. Monitoring wells at the base of the bluff (DPB-08C2, DPB-08C3, and DPB24) on the south side of Area GW 2/3 have not shown elevated levels of chlorinated hydrocarbons. The Alaska Real Estate Parking Lot site assessment results also do not show any PCE breakdown occurring or presence of vinyl chloride. If the PCE plume were to become commingled with a petroleum hydrocarbon plume downgradient of the site, then reductive dechlorination could occur that could lead to the formation of vinyl chloride.

Conclusions

The reports reviewed in the ADEC Contaminated Sites files indicate that a former waste oil tank at the ML&P Fleet Services Maintenance Facility, 1121 East 1st Avenue, was a source of TCE and PCE contamination to the groundwater. This site is hydraulically upgradient and relatively close to the GW 2/3 Area on the Anchorage Terminal property. The site also has petroleum hydrocarbon contamination from a former leaking gasoline tank that would serve as an electron donor for the reductive dechlorination of TCE and PCE to vinyl chloride. The contaminants and location of this site suggests that it is a likely source for the chlorinated VOCs that created the vinyl chloride plume observed at Area GW 2/3.

Sites located southeast of the GW 2/3 Area were found to have very low or no detectable chlorinated VOCs and do not appear to be a source for the GW 2/3 plume.

A site located south of the GW 2/3 Area with relatively high concentrations of PCE is the Alaska Real Estate Parking Lot, 717 East 4th Avenue, that was the former location of a dry cleaning facility (C&K Cleaners). Groundwater flow directions between this site and the Anchorage Terminal are not well characterized, so it is unknown if the site is hydraulically upgradient of the GW 2/3 area. The site groundwater monitoring data near the source area has also not shown the formation of breakdown products such as vinyl chloride. If the PCE plume were to encounter and mix with a petroleum hydrocarbon plume downgradient of the site, conditions would be suitable for reductive dechlorination of PCE and formation of vinyl chloride; however, the reports reviewed in ADEC's record do not provide enough information about the areas downgradient of the Alaska Real Estate Parking Lot to determine if this is the case. Based on the information reviewed, this site does not currently appear to be the source of vinyl chloride observed at the GW 2/3 Area.

References

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